B

INTERVAL NOTATION

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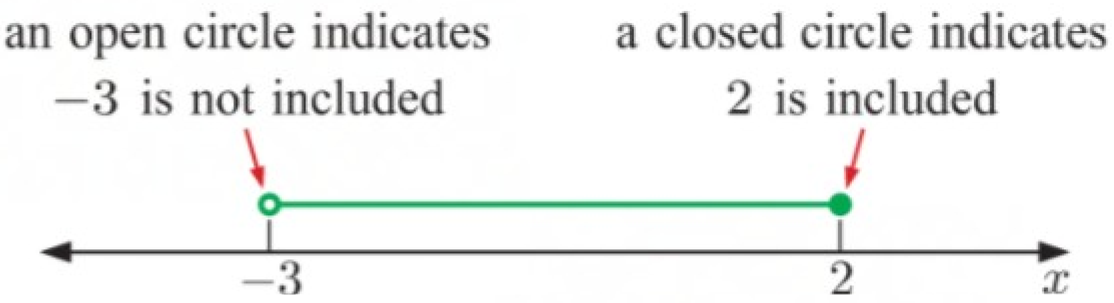
To avoid having to list all members of a set, we often use a general description of its members. We often describe a set of all values of x with a particular property.

The notation $\{x \mid ......\}$ is used to describe "the set of all x such that ......".

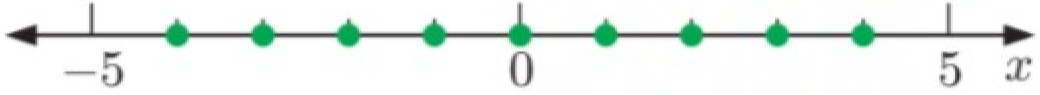
For example:

- $\{x \mid -3 < x \leqslant 2,\ \ x \in \mathbb{R}\}$
  reads "the set of all real x such that x lies between minus 3 and 2, including 2".
  We can represent the set on a number line as:



Unless stated otherwise, we *assume* we are dealing with *real* numbers. Thus, the set can also be written as $\{x \mid -3 < x \leqslant 2\}$.

- $\{x \mid -5 < x < 5,\ \ x \in \mathbb{Z}\}$
  reads "the set of all integers x such that x lies between minus 5 and 5".
  We can represent the set on a number line as:

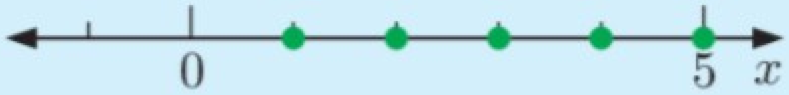


Example 2

Self Tutor

Write using interval notation:

a



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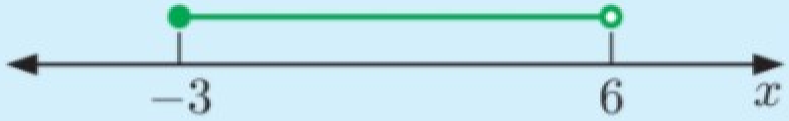
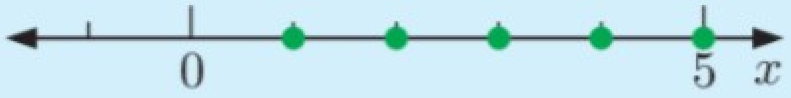


Example 2 **Self Tutor**

Write using interval notation:

a



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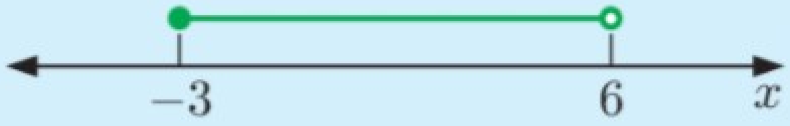


a $\{x \mid 1 \leqslant x \leqslant 5,\ \ x \in \mathbb{N}\}$

or $\{x \mid 1 \leqslant x \leqslant 5,\ \ x \in \mathbb{Z}\}$

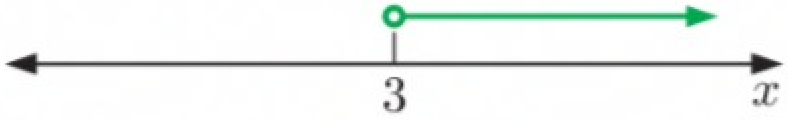
b $\{x \mid -3 \leqslant x < 6\}$

1 Explain the meaning of:

- **a** $\{x \mid x > 4\}$
- **b** $\{x \mid x \leqslant 5,\ x \in \mathbb{Z}\}$
- **c** $\{y \mid 0 < y < 8\}$
- **d** $\{x \mid 1 \leqslant x \leqslant 4,\ x \in \mathbb{Z}\}$
- **e** $\{t \mid 2 < t < 7,\ t \in \mathbb{R}\}$
- **f** $\{n \mid n \leqslant 3 \text{ or } n > 6\}$

2 Write using interval notation:

a



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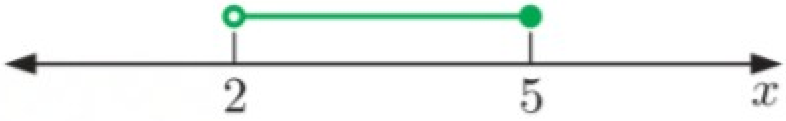
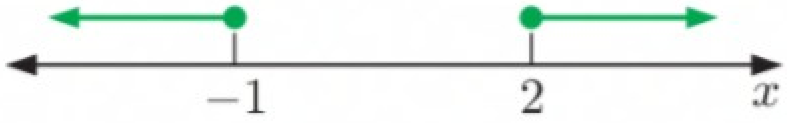
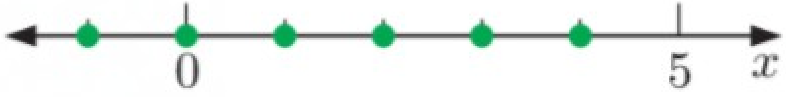


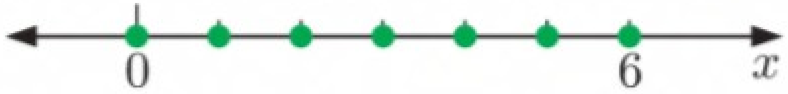
c



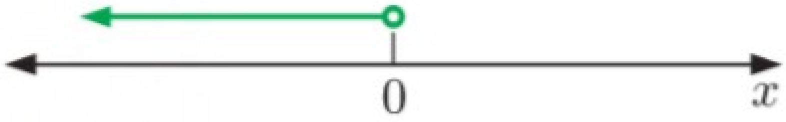
d

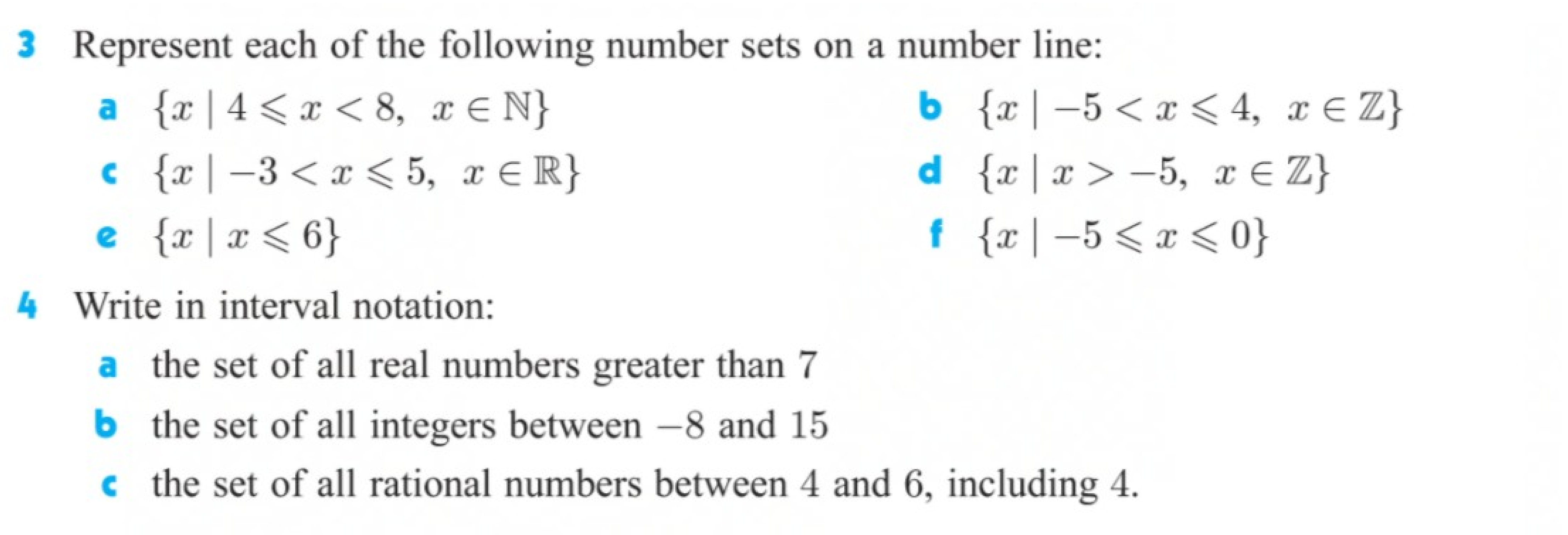


e



f





3 Represent each of the following number sets on a number line:

a $\{x \mid 4 \leqslant x < 8,\ x \in \mathbb{N}\}$

b $\{x \mid -5 < x \leqslant 4,\ x \in \mathbb{Z}\}$

c $\{x \mid -3 < x \leqslant 5,\ x \in \mathbb{R}\}$

d $\{x \mid x > -5,\ x \in \mathbb{Z}\}$

e $\{x \mid x \leqslant 6\}$

f $\{x \mid -5 \leqslant x \leqslant 0\}$

4 Write in interval notation:

a the set of all real numbers greater than 7

b the set of all integers between -8 and 15

c the set of all rational numbers between 4 and 6, including 4.

1 **a** The set of all real x such that x is greater than 4.

b The set of all integers x such that x is less than or equal to 5.

c The set of all real y such that y lies between 0 and 8.

d The set of all integers x such that x lies between 1 and 4 including 1 and 4.

e The set of all real t such that t lies between 2 and 7.

f The set of all real n such that n is less than or equal to 3 or n is greater than 6.

2 **a** $\{x \mid x > 3\}$

b $\{x \mid 2 < x \leqslant 5\}$

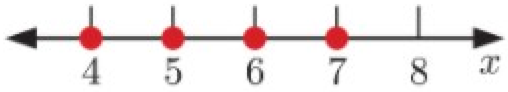
c $\{x \mid x \leqslant -1 \text{ or } x \geqslant 2\}$

d $\{x \mid -1 \leqslant x < 5,\ x \in \mathbb{Z}\}$

e $\{x \mid 0 \leqslant x \leqslant 6,\ x \in \mathbb{N}\}$

f $\{x \mid x < 0\}$

3 **a**



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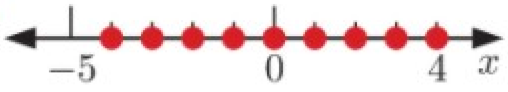

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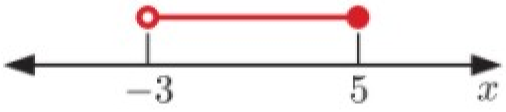
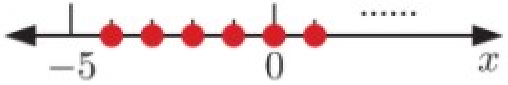


d



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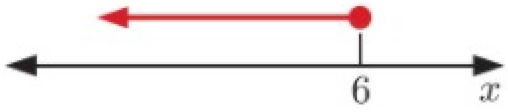

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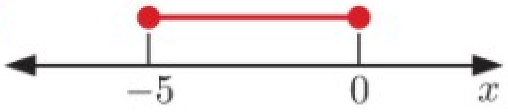

4 **a** $\{x \mid x > 7\}$

b $\{x \mid -8 < x < 15,\ x \in \mathbb{Z}\}$

c $\{x \mid 4 \leqslant x < 6,\ x \in \mathbb{Q}\}$